Biomechanics
Achieve realism in your simulations

Streamline your Biomechanics simulations through an advanced yet easy to use simulation tools-portfolio

ANSA is an advanced multidisciplinary simulation pre-processing tool that offers all the necessary functionality for full-model build-up. The broad range of functionalities and special tools, along with the high level of procedure automation, ensures efficiency for all the required tasks for Biomechanics applications. META is a highly sophisticated multi-purpose post-processor. It offers high performance, top quality 3D graphics and 2D plots, and seamless automation and reporting capabilities.

General features

- 32 or 64 bit code, for unlimited memory usage.
- Multi-core CPU usage.
- Double precision for maximum accuracy.

Topology & geometry clean-up

- CAD interfacing with neutral and native formats such as: IGES, STEP and Catia, SolidWorks.
- Integrated CAD tools for geometry handling.
- Easy identification and isolation of inner and outer surfaces, internal passages, intersections and more.
- Leak detection tools.
- Automatic identification of similar geometry and substitution with virtual linked geometry.

Model management

- Parts and properties are extracted from the CAD input data but can also be modified in the ANSA Part Manager and Property List.
- Comparison tool to simultaneously load two models and identify the geometrical differences with the option to automatically replace only the differences.

Meshing

- Automatic and robust mesh area simplification and defeaturing.
- Shell mesh generation of tria-, quad- or mixed mesh ensuring top notch quality
- Size boxes for refining specific regions and a fully automated curvature dependent surface meshing that allows the control of the mesh at regions of high importance.
- Generation of smooth layers zones with advanced controls to overcome quality and proximity issues facilitates the creation of the compact bone and articular cartilage or even the vertebral body.
- Automatic volume detection and definition algorithm. Unstructured volume mesh generation of tetra, prism, pyramid, hexa- and polyhedral elements and Structured or pure hexa-volume mesh generation through map and sweep algorithms or HexaBlock tools.
- Powerful surface wrapping tool.
- Octree trim-hexa/polyhedral meshing algorithm applicable to non-watertight models.
- Powerful reconstruction algorithm used for mesh quality improvement.
- ANSA embodies numerous quality mesh criteria for

detecting elements that can cause hour-glassing, shear-locking or element-collapse phenomena depending on the solver and automatic and manual functions to fix them.
- Contour plot of mesh colored according to mesh distortion or mesh quality.
- Mesh integrity checks (unmeshed areas, intersections, free-edges, proximities etc.).
- Detailed report of mesh information and quality statistics.

Post-processing

- Hot Spots (crucial regions and points) identification through filtering capabilities.
- Overview of results achieved through statistics tables with spreadsheet functionality.
- Integrated calculator for linear combination of results deriving from other loadcases.
- Calculation of forces and moments on any user defined section and output in solver format to be used for sub-modeling.
- Integrated powerful graph tool for direct plotting of data deriving from the 3D model or from imported solver time history files.
- Post-processing for durability and fatigue analysis is greatly assisted by parametrized sessions and scripts.
- Coupling of META with external optimizers achieved through an integrated toolbar.
- Support of CFD results format such as ANSYS FLUENT and OpenFOAM. Streamlines, pathlines, iso-surfaces and cut-planes colored by any available variable.
- Image matching and video synchronization for results validation.
- Reports creation in html, Postscript or pptx format using the Report Composer.
- Dragging and dropping images and copy to clipboard functionality for transferring data.
- Customized toolbars creation through the toolbar designer.
- Support of multiple safety factors (Failure Indices) in the same contour plot in order to compare the parts loads with their maximum load.

Model setup

- The Task Manager tool organizes a step-wise sequence procedure that manages all steps and actions necessary for the model build-up.

| Features	Benefits
• Process automation • Geometry clean up • Shell and Volume meshing • Boundary layer meshing • Interoperable decks • Solver-like entity cards • Auto positioning of parts • Model checks & fixes • Mass trimming • Substructuring • Results mapping • FE and geometry parametric morphing • Coupling with optimizers • Automated 3D & 2D post- processing • Results calculation • Automated reporting • Physical tests and simulation correlation	• Control of element growth, min-max element size and curvature refinement • Increased computational efficiency • Powerful morphing Deck for adapting an existing meshed model to similar (patient specific) geometries • Multidisciplinary processing in a single environment • Cost and time-to-market minimization • Easy handling of large and complex models • Fast generation of comprehensive and ready-to-show reports • Effortless realization and repetition of frequent tasks

- Interoperable pre-processing decks for setting-up the case inside ANSA for numerous FEA and CFD solvers.

Morphing & optimization

- A powerful morphing Deck is able to adapt an existing meshed model or geometry to similar (patient specific) geometries, sustaining the complex grid characteristics at the initial meshed model. A preview tool can validate the adaptation through the animation of the morphing model.
- Flexible parameterization of the model using morphing boxes or direct morphing tools.
- Direct coupling of ANSA and META with various optimization software and solvers.
- Support of Adjoint solver sensitivities based optimization.
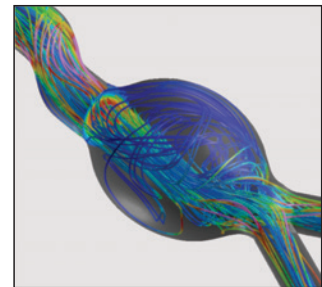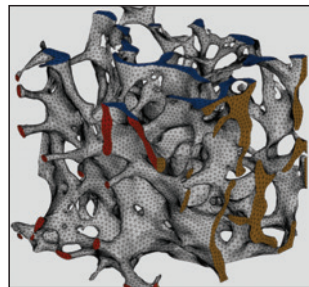
Automation

- ANSA procedures, can be automated using the Python programming language.
- User defined functions to further extend the software's functionality.
- Powerful Procedure Automation for surface and volume meshing through the Batch Mesh Tool that respects the user specified quality criteria and mesh parameters. Among others, the Batch Mesh tool offers automatic feature recognition and defeaturing, different meshing sessions for different areas of the model, local refinement or coarsening.
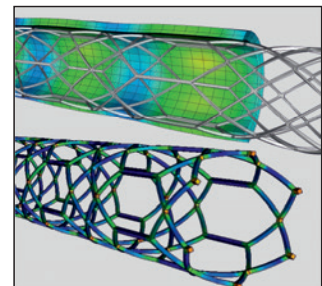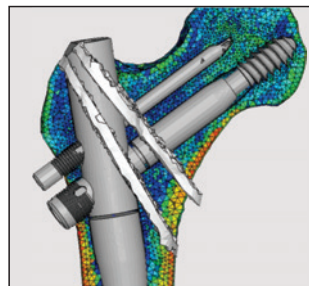
Solver FEA coupling

- Map results from a CFD analyses to different FEA meshes through the ANSA Results Mapping tool.
- Ability to map FEA calculated deformations back to CFD meshes through the Deformation Mapping tool.
- Substructuring of an area of interest on the full body, while preserving loadcase attributes of the original loadcase setup.

BETA
SIMULATION SOLUTIONS
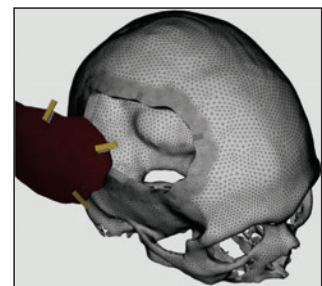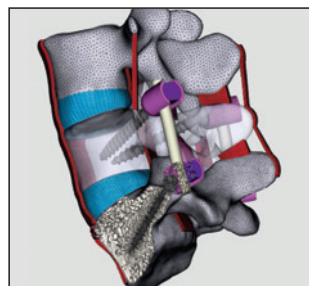
physics on screen

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